

Final project report

Project ID: 2002/6.6
Title: Study of atmospheric boundary layer processes at the Antarctic plateau station of Concordia

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Duration: 2 years
Assigned funding: € 103.200,00

Activities and results

During previous summer field campaigns at Concordia a remarkable day-time convective activity with a regular daily alternation of stable (inversion) and unstable (convection) stratification (Mastrantonio et al. 1999, Georgiadis et. al. 2002) was evidenced. It was then proposed to study the features of the diurnal evolution of the boundary layer in the transition period between summer and winter and in connection with the synoptic and large scale circulation. To achieved this objective an advanced system of atmospheric observations was developed and then installed at Dome C during the summer campaign 2004-2005. This was the main goal of this project. During the summer campaign a full atmospheric observatory was setted, and the revision and upgrade of the 10-m meteo tower was done. Guillaume Dargaud, the responsible person for our measurements at Dome C, was also in charge for radiosounding and AWS maintenance at Dome C.

An overview of the PBL atmospheric observatory measurements and the instrumentation is given in section DATA for the month of January, 2005. Similar measurements are available during the winter. Several problems occurred with the decreasing of temperature in the middle of the winter. The available measurements are the following:

- 1) turbulent fluxes of momentum, heat, humidity at the surface (sonic thermo-hygrometer);
- 2) meteorological measurements (temperature, wind velocity, humidity) at several levels (equipped 10-m tower);
- 3) energy and radiative fluxes (pyranometer, pyrgeometer);
- 4) PBL temperature profile (MPT-5P: Meteorological Temperature Profiler - Polar version);
- 5) PBL wind profile (Doppler three-axes mini-sodar);
- 6) PBL profile of ice crystals (mini-lidar).

References

Mastrantonio G., V. Malvestuto, S. Argentini, T. Georgiadis, A. Viola, 1999; Evidence of a convective boundary layer developing on the Antarctic plateau during the summer. *Meteorol. Atmos. Phys.* **71**, 127-132.
Georgiadis T., S. Argentini, G. Mastrantonio, A. Viola, G. Dargaud, R. Sozzi, 2002; Boundary Layer convective-like activity at Dome Concordia, Antarctica. "Il Nuovo Cimento" vol. 25 C, N.4 pag. 425-431.

Products

A – papers in scientific magazines

1. Contini D., G. Mastrantonio, A. Viola, S. Argentini, 2004, Mean Vertical Motions in the PBL Measured by Doppler Sodar: Accuracy, Ambiguities, *J. of Atmospheric and Oceanic Technology*, vol. 21, 1532-1544.

B – book chapters

Programma Nazionale di Ricerche in Antartide (PNRA)

1. Argentini S. and G. Mastrantonio. 2007 Atmosfera: Lo strato limite. Enciclopedia Scienza e Tecnica. Pp. 425-436. Istituto della Enciclopedia Italiana fondata da Giovanni Treccani.

C - proceedings of international conferences

1. Contini D., G. Mastrantonio, A. Viola, S. Argentini, 2004: Experimental accuracy on vertical wind velocity measured with a Doppler Sodar. Proceedings of the 11th International Symposium on Acoustic Remote sensing and Associated Techniques of the Atmosphere and Oceans, p. 104-108, Cambridge, England, (11-16 luglio).
2. Petenko I., S. Argentini, A. Bolignano, G. Mastrantonio, A. Viola, 2004. Time and horizontal scales of convective plumes at mid-latitudes and in Antarctica Proceedings of the 11th International Symposium on Acoustic Remote sensing and Associated Techniques of the Atmosphere and Oceans, p. 23-26, Cambridge, England (11-16 luglio).
3. Argentini S., G. Dargaud, I. Pietroni, A. Viola, G. Mastrantonio, A. Conidi, I. Petenko, A. Pellegrini. Behaviour of the temperature and inversion layer depth and strength at Dome C Antarctica during the 2004-2006 field experiment. Proceedings of the 13th International Symposium for the advancement of Boundary Layer Remote Sensing. , p. 137-139, Garmish, Germania, 18-20 July, 2006.
4. Neff B., S. Argentini, P. Anderson. An Overview and Highlights from a Special Session at the 2006 EGU on Boundary Layers in the High Latitudes. Proceedings of the 13th International Symposium for the advancement of Boundary Layer Remote Sensing. , p. 99-102, Garmish, Germania, 18-20 July, 2006.

D – proceedings of national meetings and conferences

1. Petenko I., S. Argentini, A. Bolignano, G. Mastrantonio, A. Viola, 2004: Temporal and spatial variation of the summer convective boundary layer at the Antarctic plateau station of Dome C. X Workshop sull'atmosfera antartica, Roma (22-24 ottobre, 2003) pp. 199-213.
2. Argentini S., Conidi A. A. Viola, G. Mastrantonio, N. Ferrara, I. Petenko, Kadygrov, E.N., Koldaev, A.V., Viazankin, A.S., 2005: Temperature measurements at Dome C using a new microwave temperature profiler. X Workshop sull'atmosfera antartica, Roma (22-24 ottobre, 2003), pp.215-228.

E – thematic maps

F – patents, prototypes and data bases

G – exhibits, organization of conferences, editing and similar

1. 2005 S. Argentini, Antarctic meteorology. Polar regions and Quaternary Climate. Maratea 24-29 settembre (Relazione ad invito)

H - formation (PhD thesis, research fellowships, etc.)

1. 2004 S. Argentini Relatore di tesi di laurea presso l'Università degli Studi di Roma "La Sapienza" dal titolo: Studio dell'evoluzione dello strato limite atmosferico a Dome C mediante l'utilizzo di dati osservativi e modellistica
2. 2004 S. Argentini Relatore di tesina di laurea in Fisica presso l'Università degli Studi di Roma "La Sapienza" dal titolo: "Misure di temperatura nello strato limite planetario mediante un radiometro passivo nelle micro onde sviluppato per lo studio del PBL in Antartide".

Research units

UO Stefania Argentini ISAC/CNR

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- Alessandro Conidi Tecnico IFA/CNR
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Data:

An example of available data is given below for the month of January 2005

Legend:

[.]: incomplete; []: missing

[A]rgos AWS, CR[1]0, CR[2]3,

[L]idar, [M]eteoflux, [R]adiometer, [B]alloon, [S]odar, [C]oncordia weather station, [W]ecam and 2nd [w]ebcam.

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2005/01/01: . 1 2 L M R S W
2005/01/02: . 1 2 L M R S W
2005/01/03: . 1 2 . M R S .
2005/01/04: . 1 2 M R S W
2005/01/05: A 1 2 M R S W
2005/01/06: . 1 2 M R S W
2005/01/07: . 1 2 M R S W
2005/01/08: . 1 2 . M R . W
2005/01/09: . 1 2 L M R S W
2005/01/10: . 1 2 L M R S W
2005/01/11: . 1 2 . M R . W
2005/01/12: . 1 2 L M R . W
2005/01/13: . 1 2 L M R S W
2005/01/14: . 1 2 L M R S W
2005/01/15: . 1 2 L M R S W
2005/01/16: . 1 2 L M R S W
2005/01/17: . 1 2 . M R S W
2005/01/18: . 1 2 L M R S W
2005/01/19: . 1 2 L M R S W
2005/01/20: . 1 2 L M R S W
2005/01/21: . 1 2 . M R S W
2005/01/22: . 1 2 L M R . W
2005/01/23: A 1 2 L M R S W
2005/01/24: . 1 2 L M R . W
2005/01/25: . 1 2 . M R . .
2005/01/26: . 1 2 L M R . W
2005/01/27: . 1 2 L M . S .
2005/01/28: . 1 2 L M . B S .
2005/01/29: . 1 2 . M . . .
2005/01/30: . 1 2 L M R . W
2005/01/31: . 1 2 L . R S . W
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Note

Below a picture showing the setting of the Concordia atmospheric field camp

Concordia Atmos Field Camp

